

November 4, 2002

Mr. John L. Skolds, President  
Exelon Nuclear  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2 - ISSUANCE OF  
AMENDMENTS RE: HEAVY LOADS HANDLING (TAC NOS. MB6416 AND  
MB6417)

Dear Mr. Skolds:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 209 to Facility Operating License No. DPR-29 and Amendment No.204 to Facility Operating License No. DPR-30 for the Quad Cities Nuclear Power Station, Units 1 and 2, respectively. The amendments consist of changes to the Updated Final Safety Analysis Report (UFSAR) in response to your application dated October 1, 2002, as supplemented October 23, 2002.

The amendments consist of a one-time change that revises the licensing basis as described in the UFSAR to allow lifting heavier loads with the reactor building crane during the Unit 1 refueling outage beginning in November 2002.

A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

**/RA/**

Carl F. Lyon, Project Manager, Section 2  
Project Directorate III  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-254 and 50-265

Enclosures: 1. Amendment No. 209 to DPR-29  
2. Amendment No. 204 to DPR-30  
3. Safety Evaluation

cc w/encls: See next page

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\*\*Previously concurred

ADAMS Accession Number: ML023020118

\*SE dated 10/24/2002

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OFFICIAL RECORD COPY

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Quad Cities Nuclear Power Station Units 1 and 2

- 2 -

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EXELON GENERATION COMPANY, LLC

AND

MIDAMERICAN ENERGY COMPANY

DOCKET NO. 50-254

QUAD CITIES NUCLEAR POWER STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No.209  
License No. DPR-29

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated October 1, 2002, as supplemented October 23, 2002, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, paragraph 3.B. of Facility Operating License No. DPR-29 is hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 209, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 60 days of the date of issuance. In addition, the licensee shall include the revised information in the Updated Final Safety Analysis Report submitted to the NRC, pursuant to 10 CFR 50.71(e), as described in the licensee's application dated October 1, 2002, as supplemented October 23, 2002, and evaluated in the staff's safety evaluation for this amendment.

FOR THE NUCLEAR REGULATORY COMMISSION

*/RA by L. Raghavn for/*

Anthony J. Mendiola, Chief, Section 2  
Project Directorate III  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Date of Issuance: November 4, 2002

EXELON GENERATION COMPANY, LLC

AND

MIDAMERICAN ENERGY COMPANY

DOCKET NO. 50-265

QUAD CITIES NUCLEAR POWER STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 204  
License No. DPR-30

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated October 1, 2002, as supplemented October 23, 2002, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, paragraph 3.B. of Facility Operating License No. DPR-30 is hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 204, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 60 days of the date of issuance. In addition, the licensee shall include the revised information in the Updated Final Safety Analysis Report submitted to the NRC, pursuant to 10 CFR 50.71(e), as described in the licensee's application dated October 1, 2002, as supplemented October 23, 2002, and evaluated in the staff's safety evaluation for this amendment.

FOR THE NUCLEAR REGULATORY COMMISSION

*/RA by L. Raghavan for/*

Anthony J. Mendiola, Chief, Section 2  
Project Directorate III  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Date of Issuance: November 4, 2002



SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 209 TO FACILITY OPERATING LICENSE NO. DPR-29  
AND AMENDMENT NO. 204 TO FACILITY OPERATING LICENSE NO. DPR-30  
EXELON GENERATION COMPANY, LLC  
AND  
MIDAMERICAN ENERGY COMPANY  
QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2  
DOCKET NOS. 50-254 AND 50-265

1.0 INTRODUCTION

By application dated October 1, 2002, as supplemented by letter dated October 23, 2002, Exelon Generation Company, LLC (Exelon, the licensee) requested changes to the licensing basis as described in the Updated Final Safety Analysis Report (UFSAR) for the Quad Cities Nuclear Power Station, Units 1 and 2 (QCNPS). The supplement dated October 23, 2002, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on October 4, 2002 (67 FR 62270).

The proposed amendments would allow a one-time change to the licensing basis as described in the UFSAR to allow lifting heavier loads with the reactor building crane during the Unit 1 refueling outage beginning in November 2002. Specifically, the proposed changes would revise Section 9.1.4.3.2, "Reactor Building Overhead Crane," of the UFSAR. The revisions would allow the reactor building overhead crane to lift heavy loads up to 125 tons without a complete analysis of the consequences of a load drop. This would allow the licensee to remove the Unit 1 reactor shield plugs, transfer the shield plugs to the refueling floor above Unit 2 without restrictions on Unit 2's operation, and reinstall the shield plugs in support of the upcoming Unit 1 refueling outage, Q1R17, scheduled for November 2002. The proposed amendments are for refueling outage Q1R17 only.

2.0 REGULATORY EVALUATION

In NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," dated July 1980, the staff provided regulatory guidelines for heavy load lifts. These guidelines were divided into two phases (Phase I and II) for implementation by licensees to assure safe handling of heavy loads in areas where a load drop could impact on stored spent fuel, fuel in the reactor core, or equipment that may be required to achieve safe shutdown or permit continued decay heat

removal. Phase I guidelines address measures for reducing the likelihood of dropping heavy loads and provide criteria for establishing safe load paths, procedures for load handling operations, training of crane operators, design, testing, inspection, and maintenance of cranes and lifting devices, and analyses of the impact of heavy load drops. Phase II guidelines address alternatives to either further reduce the probability of a load handling accident or to mitigate the consequences of heavy load drops. These alternatives included using a single-failure-proof crane for increased handling system reliability, employing electrical interlocks and mechanical stops for restricting crane travel to safe areas, or performing load drops and consequence analyses for assessing the impact of dropped loads on plant safety and operations. Appendix C to NUREG-0612 provides alternative means of upgrading the reliability of existing cranes to single-failure-proof standards.

Generic Letter (GL) 85-11, "Completion of Phase II of Control of Heavy Loads at Nuclear Power Plants, NUREG-0612," dated June 28, 1985, dismissed the need for licensees to implement the Phase II guidelines of NUREG-0612 based on the improvements obtained from the implementation of NUREG-0612 Phase I. However, GL 85-11 encouraged licensees to implement actions they perceive to be appropriate to provide adequate safety.

In Nuclear Regulatory Commission (NRC) Bulletin (NRCB) 96-02, "Movement of Heavy Loads over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment," dated April 1996, the staff addressed specific instances of heavy load handling concerns and requested licensees to provide specific information detailing their extent of compliance with the guidelines and their licensing basis.

The basis for the guidelines in NUREG-0612 was to minimize the occurrence of the principal causes of load handling accidents and to provide an adequate level of defense-in-depth for handling of heavy loads near spent fuel and safe shutdown systems. Defense-in-depth is generally defined as a set of successive measures that reduce the probability of accidents and/or the consequences of such accidents. In the area of control of heavy loads, the emphasis is on measures that prevent load drops or other load handling accidents. These measures include: use of rigorous crane design standards with substantial safety margins; implementation of prudent maintenance, testing, and inspection guidance; selection and use of appropriate lifting devices; and establishment of crane operator training programs and heavy load handling procedures. Measures to reduce the consequences of potential load handling accidents include: restricting, by procedure or interlock, the travel of heavy loads to reduce the potential that a dropped load would damage spent fuel or safe shutdown equipment; verifying by analysis that intervening structures would prevent a dropped load from damaging spent fuel or safe shutdown equipment; or verifying by analysis that the damage to critical structures, systems, and components from a dropped load would remain within acceptable limits. At a minimum, the operational restrictions that maintain heavy loads within selected safe load paths provide some defense-in-depth in addition to measures that reduce the probability of a load drop by reducing the likelihood that a dropped load could damage critical structures, systems, and components.

The Quad Cities units are boiling water reactors (General Electric design) that operate with shield plugs located above the drywell (containment) head. The QCNPS reactor building crane has been licensed as a single-failure-proof crane for loads up to 110 tons. This rating was considered adequate to encompass all loads typically handled during refueling operations, including the reactor shield plugs. Accordingly, a load drop accident while handling the reactor

shield plugs with the QCNPS reactor building crane was not considered credible, and the existing QCNPS UFSAR does not include an evaluation of the consequences of such a load drop. However, the licensee concluded that the weight of the QCNPS reactor shield plugs and associated handling equipment may exceed the 110 ton rating of the crane based on the results of a recent weight determination at Dresden Nuclear Power Station (DNPS), which found a weight of 115 tons for one-half of the upper layer. From a licensing perspective, drops of loads exceeding the single-failure-proof critical load rating are credible accidents. In accordance with 10 CFR 50.59, a license amendment shall be obtained prior to implementing conditions that create the potential for an accident of a different type than previously evaluated in the UFSAR. To accommodate variations in concrete density and finished dimensions, the amendment request proposes an increase in permissible load to 125 tons.

The QCNPS common refuel floor is designed to support the complete disassembly of both Unit 1 and Unit 2 reactors simultaneously, with all equipment stored within the boundaries of each unit. While this is an option for an emergency shutdown, eventual decommissioning or safe store operations, it is impractical for general refueling operations because of additional laydown space that is required. The licensee plans to conduct the handling of heavy loads at QCNPS Units 1 and 2 during power and refueling operations. Unit 2 is planned to be operating at power during movement of the shield plugs, and removal of the shield blocks is planned to start prior to the complete shutdown of Unit 1. Because it would be impractical to conduct the refueling outage by placing the shield blocks on the Unit 1 refuel floor, the shield plugs are planned to be carried over sections of the Unit 2 refuel floor that may be directly above safe shutdown equipment associated with the operating unit. The licensee stated that laydown areas were selected to support outage critical path activities and minimize crane moves.

The licensee plans to revise Section 9.1.4.3.2 of the QCNPS UFSAR to support refueling outage Q1R17 as follows:

paragraph 9.1-66 currently reads:

“The reactor building crane is single failure proof. Within the dual load path, the design criteria are such that all dual elements comply with [Crane Manufacturers Association of America] CMAA Specification No. 70 for allowable stresses, except for the hoisting rope which is governed by more stringent job specification criteria....”

paragraph 9.1-66 has been proposed to read:

“The reactor building crane is designated as a single failure proof crane for 110-ton loads. The NRC has approved use of the reactor building overhead crane during power operations to lift a total load up to 125 tons for removal and installation activities for the reactor shield blocks prior to and during Unit 1 refueling outage Q1R17. Within the dual load path, the design criteria are such that all dual elements comply with [Crane Manufacturers Association of America] CMAA Specification No. 70 for allowable stresses, except for the hoisting rope which is governed by more stringent job specification criteria....”

paragraph 9.1-69 currently reads:

“The reactor building main crane meets the single-failure criteria stated in NUREG-0612. As required by CMAA-70, the maximum crane load weight plus the weight of the bottom block, divided by the number of parts of rope does not exceed 20 percent of the manufacturer’s published breaking strength.”

paragraph 9.1-69 has been proposed to read:

“The reactor building overhead crane meets the single-failure criteria stated in NUREG-0612 for heavy loads of 110-tons. The NRC has approved use of the reactor building overhead crane during power operations to lift a total load up to 125 tons for removal and installation activities for the reactor shield blocks prior to and during Unit 1 refueling outage Q1R17. As required by CMAA-70, the maximum crane load weight plus the weight of the bottom block, divided by the number of parts of rope does not exceed 20 percent of the manufacturer’s published breaking strength.”

The staff finds that the licensee in sections B and C of Attachment A of its submittal identified the applicable regulatory requirements. The regulatory requirements for which the staff based its acceptance are NUREG-0612, GL 85-11, and NRC Bulletin 96-02.

### 3.0 TECHNICAL EVALUATION

The proposed amendment revises the QCNPS Units 1 and 2 reactor building overhead crane licensing basis to support power and refueling operations during Q1R17 only. In the staff review, considerations are given to the crane design, installation, inspection, testing, maintenance, and operating procedures relative to the credibility of load drop accidents and the resulting potential for damage to important structures, systems, and components during power operations and refueling for loads weighing up to 125 tons during refueling outage Q1R17.

The licensee stated that the requested one-time amendment is acceptable for the following reasons:

- The reactor building crane was modified with the intent of qualifying it as single-failure-proof for 125 tons. The reactor building crane has additional capacity for a total lifted load of the 125 tons with single-failure-proof features if a design basis earthquake (DBE) is not assumed;
- The probability of a DBE during the limited duration of the request is very small; and
- To provide additional assurance of safety, QCNPS will impose load handling restrictions derived from load drop analyses demonstrating that postulated drops of shield plugs at DNPS would not damage safety-related equipment.

In order to provide long-term resolution of this issue, the licensee stated it would submit additional analyses to support a permanent change in the reactor building crane’s licensing basis to resolve any future issues with respect to heavy load handling.

The Phase I guidelines of NUREG-0612 address measures for reducing the likelihood of dropping heavy loads and provide criteria for establishing safe load paths, procedures for load handling operations, training of crane operators, design, testing, inspection, and maintenance of cranes and lifting devices, and analyses of the impact of heavy load drops. Moreover, the licensee made Phase I commitments to the guidelines of NUREG-0612 in their response to GL 80-113, "Control of Heavy Loads," which was issued on December 22, 1980. In describing the implementation of the Phase I requirements at QCNPS, the licensee provided drawings defining normal and alternate safe load paths for the reactor vessel head, and safe load paths for the dryer/separator equipment and the drywell head. Safe load handling procedures for the shield plugs had not been developed at that time, but the licensee stated that the entire reactor building refueling floor, with the exception of the fuel pool and open reactor cavity, was considered a safe load path zone. This conclusion was supported by the design of the refueling floor for a live load of 1000 pounds per square foot and an analysis concluding that a 9 ton load dropped from 7 feet above the floor would not cause damage to the floor. The staff, as part of its Phase I review, did not identify any changes and/or modifications needed to satisfy the guidelines of NUREG-0612, Phase I. By letter dated June 27, 1983, the staff issued its safety evaluation, which accepted the licensee's implementation of the Phase I guidelines of NUREG-0612.

The reactor building crane was originally rated for a load of 125 tons. A static stress analysis of all major components at this loading demonstrated significant margin to yield. However, the staff accepted the reactor building crane as a single-failure-proof crane, which has increased handling system reliability, for handling loads up to 110 tons. This rating considered an increase in load of 15 percent vertically and 88 percent horizontally resulting from the design basis earthquake. Therefore, removal of the design basis earthquake loads would allow a minimum increase of 15 percent in the load carrying capacity of the crane using the same allowable limits used for the single-failure-proof load rating. This margin is more than sufficient to offset the increase in the lifted load to 125 tons. Redundancy in the load path and critical control components that was recognized by the NRC in approving the crane as single-failure-proof is unaffected by the increase in static load. Therefore, the reactor building overhead crane has more than enough capacity to handle loads up to 125 tons during operation in the absence of a seismic event.

The licensee stated that, based upon the seismic estimates for the QCNPS site that the NRC has published in NUREG-1488, "Revised Livermore Seismic Hazard Estimates for Sixty-Nine Nuclear Power Plant Sites East of the Rocky Mountains, 1994," the frequency of equaling or exceeding the QCNPS DBE level is very low. Considering that the total duration of the lifting activities is not expected to exceed 24 hours during Q1R17, the probability of an earthquake equaling or exceeding the design-basis earthquake magnitude during the heavy load lifts of concern is negligible.

The staff has evaluated the potential for heavy load drops at commercial nuclear power plants for loads of approximately 30 tons or greater. This evaluation was done with a representative sample of crane operating experience obtained from approximately 19 power plants. This data was put into a database and, based on the sample, estimates of the number of heavy load lifts of  $\geq 30$  tons was made. The total number of estimated heavy load lifts ( $\geq 30$  tons) for all US nuclear power plants that operated from 1980 through October 1999 was approximately 47,400. Also, crane issues or event information obtained from searching NRC record files, licensee event reports, other licensee documents, and industry documents was used to form the basis

for the industry operating experience. The staff found records of two "load slips" and one "load drop" that involved heavy loads, but these events occurred at facilities without operating licenses. For heavy loads lifted at plants that had an operating license and had implemented NUREG-0612 guidelines, there were no actual load drops. To be conservative, one heavy load drop was assumed to have occurred during the period of interest (1980 through 1999). Assuming that the number of heavy load lifts was 47,400, the staff estimated the load drop frequency (drops/number of lifts) was  $2E-05$ . Therefore, based on substantial industry experience, the likelihood of a load drop during the few shield plug movements expected for Q1R17 is very low.

In response to staff questions regarding defense-in-depth for potential heavy load drops, the licensee described the implementation of safe load paths for the shield plugs at QCNPS and the validity of DNPS load drop analyses to QCNPS. The safe load path guideline of NUREG-0612 states, in part, that the load path should follow, to the extent practical, structural floor members, such that, if the load is dropped, the structure is more likely to withstand the impact. The licensee stated that QCNPS load handling procedures ensure that heavy load heights are maintained as low as practical and that the size and orientation of the shield plugs ensures the load will remain over reactor building structural members during movement. The licensee also compared the strength and configuration of reactor building structural members at QCNPS to those at DNPS and concluded that the refueling floor structural elements are similar. Therefore, the load drop analyses for DNPS are sufficiently valid for QCNPS to provide additional assurance that no adverse consequences would result from a postulated drop of a shield plug at QCNPS.

### 3.1 Technical Conclusion

The staff concludes that heavy loads up to 125 tons in weight can be moved safely by the reactor building crane during QCNPS Unit 1 Refueling Outage 17. The crane is considered single-failure proof for loads of up to 110 tons, and the crane was originally designed with a 125 ton rating. Therefore, the crane has special design features that reduce the probability of a load drop and adequate structural capacity to handle loads up to 125 tons. The duration of the load lifts exceeding the 110 ton single-failure-proof load rating is sufficiently short that the potential for significant dynamic loads generated by earthquake motion is negligible. Existing commitments to the general guidelines of NUREG-0612 provide assurance that industry operating experience indicating a very low frequency of load drops is valid for QCNPS. Finally, an element of defense-in-depth will be maintained by complying with the intent of safe load path guidelines from NUREG-0612 and implementing load handling restrictions, which provide assurance that a load drop would not cause significant damage to the refueling floor.

### 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Illinois State official was notified of the proposed issuance of the amendment. The State official had no comments.

### 5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no

significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (67 FR 62270). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

## 6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: S. Jones

Date: November 4, 2002